

I.1.1 OVERVIEW OF THE NATIONAL WEATHER SERVICE RIVER FORECAST SYSTEM (NWSRFS)

Introduction

The National Weather Service River Forecast System (NWSRFS) is a collection of interrelated software and data capable of performing a wide variety of hydrologic and hydraulic functions. NWSRFS has many components and it is constantly being changed and improved as new components are added and existing components are modified.

The purpose of this overview of NWSRFS is to show the interactions among the major systems comprising NWSRFS and to briefly describe the functions performed by each system.

NWSRFS contains the following major systems which use the same hydrologic and hydraulic models:

- o Calibration System which is used to:
 - generate time series based on historical data
 - determine model parameters
- o Operational Forecast System (OFS) which uses calibrated parameters to:
 - generate short-term river and flood forecasts
 - maintain model state variables
- o Extended Streamflow Prediction (ESP) System which uses current model states, calibrated parameters and historical time series to:
 - generate probabilistic forecasts extending weeks or months into the future
- o Flash Flood Guidance (FFG) system which uses current model states to compute flash flood guidance values

Figure 1 shows how these systems interact.

Calibration System

The Calibration System is used to investigate the performance of various hydrologic techniques using historical data both for pure research purposes and for calibrating hydrologic models (estimating parameters) used in the Operational Forecast System. Historical data access programs are available to inventory archived hydrometeorological data and convert it from the archive format to a standard data file format. Calibration preprocessor programs are available to compute mean areal values of precipitation (MAP), temperature (MAT), etc., from point values.

The programs used to calibrate the hydrologic models are the Manual Calibration Program (MCP) and the Automatic Parameter Optimization Program (OPT). MCP operates by applying hydrologic models with user specified values for all parameters. OPT operates in a similar manner but it includes a procedure to automatically adjust parameter values to improve the streamflow simulation. The calibration software is

intended for use on just one segment of a river system at a time.

A major river system is calibrated an area at a time with a typical calibration run spanning several years of historical data. In contrast the Operational Forecast System operates on an entire river system but for comparatively short time periods.

Operational Forecast System

The NWSRFS Operational Forecast System is a continuous river forecasting system which provides the forecaster with predictions of river flow to use in producing flood forecasts and other hydrologic products. The system stores observed and future point data (precipitation, temperature, stage, etc.), performs various preprocessor functions on the observed data (mean areal precipitation, stage to discharge conversion, etc.) and produces forecast products (e.g. plots of predicted, simulated and observed river stage at selected points).

Parameter values are normally determined using the Calibration System and transferred to the Operational Forecast System through a manual preparation step. This manual preparation is needed to add the description of operations which are particular to forecasting (e.g. blend routines, different plot options).

Extended Streamflow Prediction System

The Extended Streamflow Prediction (ESP) System produces long range probabilistic forecasts of hydrologic variables. ESP assumes that historical meteorological data are equally likely to occur in the future. ESP accesses files in the Operational Forecast System for an estimate of the current hydrologic state and uses historical meteorological data to create many equally likely sequences of future hydrologic conditions each starting with current conditions.

The ESP system is designed to run a large river system and many years of historical data. The most typical use of ESP is for water supply forecasting although the ESP logic can be used for a variety of long-range forecast needs (e.g. beyond 30 days in the future).

Flash Flood Guidance System

The Flash Flood Guidance (FFG) System includes techniques and programs for computing flash flood guidance values. The method used to compute flash flood guidance is the reverse of the normal use of a rainfall runoff model in which runoff is desired. For flash flood guidance purposes a specific amount of rain is needed to produce a given amount of runoff based on estimates of current soil moisture conditions as maintained by soil moisture accounting models.

FIGURE 1. NATIONAL WEATHER SERVICE RIVER FORECAST SYSTEM (NWSRFS)

